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The Action of γ-Rays on Collagen.

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Most of the work so far reported on the action of ionizing radiation on proteins has been carried out on solutions and little detailed information is available of the effect on insoluble fibrous proteins.

Four samples of ground ox-hide collagen, sealed in tubes in atmospheres of oxygen or nitrogen and with moisture contents of 5 and 80 %, were given 5×10^7 rads of γ-irradiation.

Apart from a slight yellowing no visible change took place during irradiation in those samples containing 5 % moisture. When immersed in water they swelled to a soft gel which slowly dissolved. Collagen with 80 % moisture swelled during irradiation to a firm gel. This was not observed to shrink or dissolve even in boiling water.

In cold 0·1 N-acetic acid about 95 % of the irradiated collagen containing 5 % moisture dissolved in 24 hr., compared with 5 % dissolution of the irradiated samples containing 80 % moisture, and 1 % dissolution of the control. Dialysis indicated the presence of a large proportion of low molecular weight material in the solutions.

In all samples there was an overall 10–15 % loss of amino acid residues. Losses of individual amino acids varied considerably, but the basic compounds and those with a ring structure seemed to possess a sensitivity to radiation higher than the average.

There was some loss of nitrogen but little free ammonia was found on opening the tubes. There was also an 80–100 % increase in amide-N, suggesting breakdown of peptide chains, but only small amounts of keto acids were detected. Evidence of peptide-bond rupture of a different nature was obtained by a study of the *N*-terminal amino groups, which increased to 2–4 times that of the control.

This evidence is consistent with a loss of molecular structure and decrease in chain length. In the wet state, at least, formation of some new crosslinks occurs to stabilize the molecule.

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